Rohde & Schwarz Topex

MobiLink ISDN2GSM

ISDN BRI Gateway

Installation Manual

2012

ROHDE&SCHWARZ

Dear Client!

Thank you for buying MobiLink ISDN 2 GSM and congratulations for your excellent choice!

By purchasing MobiLink ISDN 2 GSM you have opted for:

- cutting down the costs of your cellular calls
- mobile-2-ISDN interface with LCR capabilities
- excellent quality of audio signal
- availability of SMS and data functions
- convenient, easy to use e-mail to SMS and SMS to e-mail feature
- perfect compatibility to ISDN private branch exchanges (PBX)
- routing functions assured even when used as standalone unit
- full compatibility with GSM 900/1800 or 850/1900 networks
- saving of ports in your PBX exchange
- easy and quick installation and usage
- small investment, it pays itself of in the first month, then you achieve important savings of phone bills

Conformity!

ROHDE&SCHWARZ

Rohde & Schwarz Topex S.A.

Declaration of Conformity

No: 1366

We, designer and manufacturer

Rohde & Schwarz Topex
Feleacu 10, 1st District, Bucharest
014186, ROMANIA
www.topex.rohde-schwarz.com

Declare under our sole responsibility that the product:

Product Name: **MobiLink ISDN 2 GSM**

Product Description: Interface to ISDN over GSM networks
frecquency band: GSM (900/1800/850//1900 MHz) / GPRS

to which this declaration relates is in conformity with the essential requirements and other relevant requirements of the R&TTE Directive (1999/5/EC).
The product is in conformity with the following standards and / or other normative documents:

Health & Safety (Art. 3(1)(a)):
EN 60950-1:2006 / A11:2009

EMC (Art. 3(1)(b)):
EN 55022:2000
EN 55024:2001

MobiLink ISDN 2 GSM is equipped with Cinterion Wireless Module MC55i, which conform to:

Health & Safety (Art. 3(1)(a)):
EN 60950-1:2006+A11:2009

EMC (Art. 3(1)(b)):
EN 301 489-1 : v1.8.1 / EN 301 489-7 : v1.3.1

Spectrum (Art. 3(2)):
EN 301 511, V9.0.2 (2003-03)
Conformity Declaration issued by Cinterion Wireless Modules GmbH, Siemensdamm50, 13629 berlin, Germany.

Product has applied the **CE** conformity mark since 2005.

Supplementary information:

Notify Body involved: CETECOM, Spain and ICPE Bucharest, Romania.
Technical file held by:
The technical documentation relevant to the MobiLink ISDN 2 GSM product is held at Rohde & Schwarz Topex Company at the address mentioned above.

Place and date of issue (of this DoC): 13th of December 2011, Bucharest, Romania

Signature: _____ Signature: _____

President Mr. ADAMESCU Dan Q.A Director. Mrs. PĂUNOIU Carmen

Rohde & Schwarz Topex SA Bucuresti

S. C. Rohde & Schwarz Topex S.A. - two-tier managed company; IBAN EUR: RO91BRDE410SV18500744100; IBAN USD: RO12BRDE410SV18800114100;
Trade Registry reg. no.: J40/21109/1994, Fiscal registration code: RO 6502278; Capital Share: 240000 RON

WEEE Directive Compliance

WEEE Directive

This symbol applied on your product or on its packaging means that this product fulfils the WEEE Directive. The product shall not be recycled as household waste; it will be disposed separately as sorted waste.
Regarding to WEEE Directive the recycling EE equipments must be accomplish separately in purpose of natural resources preserving and to avoid the occurring negative effects about human health and environment. The acquired product shall not be treated like household waste and will be given to a specialized company.
! Please do not dispose your Rohde & Schwarz Rohde&Schwarz Topex product as unsorted waste (household waste), recycle it to protect the environment. Separate the packages according to waste disposal options and sort it for recycling.

For supplementary information contact us to:
Phone: +4021 408 39 00 or
www.topex.ro

Record of Changes

ISSUE	DATE	NUMBER OF PARAGRAPH	A* M D	TITLE OR BRIEF DESCRIPTION	MADE BY
A-F	2005 – 2009	All	A,M	First issue and changes	C. Malide V. Sfetcu
G	2011	All	M	Change company name	V. Sfetcu
H	2012	Cover, conformity	A,M	Added conformity information	V. Sfetcu

A – Added , M- Modified, D- Deleted

Several problems:

- Any call from a fixed phone to a mobile network includes two kinds of charges: the fee of the wireless carrier (operator) and the fee for the fixed telephony operator
- Additionally, the calls to your headquarters from the mobile phones of your employees at remote locations are also charged twice
- You have to pay several mobile subscriptions with high tariff per call
- If you use a vocal mailbox, you must pay for checking your messages
- When you have a ISDN exchange, the ISDN features and services are not directly connected to the GSM or 3G+ network
- GSM phone bill may be difficult to control; you may end up paying large costs for the calls performed.

One solution:

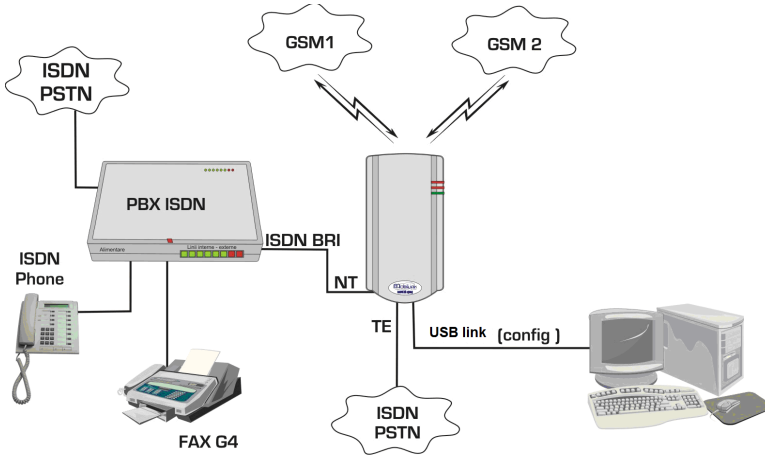
MobiLink ISDN 2 GSM achieves a direct link between the ISDN phone exchange in your office and one or several wireless telephony networks. Consequently, it is easier to connect and the costs of fixed-to–mobile calls will be cut down by as much as 60%. You will avoid telephone fees for the interconnection between GSM/3G+ network and the PSTN carrier.

Also, calls coming from the cell phones of your personnel out in the field will be cheaper as well. The call-back function transfers the charging form the mobile phones in the filed to the SIM cards of the MobiLink ISDN at headquarters.
Since all mobile calls are now brought together, you may use the most convenient tariff rate of your GSM operator (low cost per call for high volume of traffic).

When you connect your own voice mailbox to the ISDN 2 GSM interface you no longer have to pay for listening to voice messages or for reading the messages.

The MobiLink interface allows you to restrict outgoing calls to certain phone numbers, so you won't have to pay anymore for the calls that you restricted.

By means of the MobiLink ISDN 2 GSM unit, you can use the ISDN services together with the mobile services, the Rohde&Schwarz Topex box enables several kinds of ISDN connection. You can add up several units, to ensure optimal cost routing in case of three or more mobile carriers, or when you need a higher capacity – to perform more calls at the same time.



With it, you have a simple means to use conditioned and unconditioned call forwarding.

You can easily send and receive SMS messages from your computer, and perform conversion between text messages and e-mail.

The device can also provide detailed records of time and duration of outgoing calls, so you keep your phone costs under control.

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Revision H, april 2012.

1. What is MobiLink ISDN2GSM?

It is an advanced interface for your profit!

By interfacing between an ISDN phone exchange and the mobile telephony network (GSM 900/1800 or 850/1900) it cuts down the costs of fixed-to-GSM and GSM–to-fixed calls. ISDN 2 GSM was designed to be connected to any ISDN phone exchange so it meets standard ISDN PBX requirements.

It may be used as GSM interface for an ISDN a phone exchange. Even when used as standalone unit with an ISDN phone set it can still perform routing of the calls for minimum costs. Also, by means of a terminal adapter it can be used with analog (standard) telephones or with a payphone.

The unit works primary in voice mode, that is re-routes incoming or outgoing calls through the corresponding wireless network. This way you will pay just the cost of a mobile-to-mobile call inside the same carrier network, instead of the cost of fixed-to-mobile call.

The interface enables several types kinds of ISDN connection and may be used for services such as call forwarding (conditioned or unconditioned), DISA and voice messages.

When connected to a computer, you may use the ISDN-2-GSM equipment to receive and send out SMS.

By connecting MobiLink ISDN-2-GSM to an ISDN phone exchange, all local extensions can make calls to GSM networks while keeping down the costs. Also, when making a call the subscriber is no longer subjected to RF radiations from the cell-phone. More, the external antennas can be located in a place for optimal reception (higher intensity of the radio signal).

Since MobiLink ISDN-2-GSM can send billing pulses, you may also use a public telephone (payphone) with it, by means of terminal adapter.

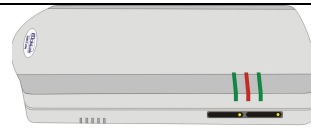
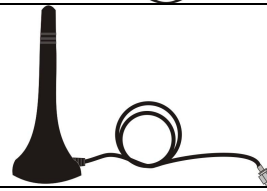
Finally, ISDN-2-GSM may be used as small ISDN phone exchange by itself, since it can interconnect up to 8 ISDN local phones and perform automated routing of calls for minimum cost.

The unit includes the GSM modules, so it does not need supplementary devices (such as an external GSM phones) to work. Its two SIM cards allow routing the call through the corresponding GSM operator, for least cost.

Its installation is simple; you just insert the SIM cards and plug in the cables (USB for configuration, ISDN lines, external antennas, power adapter). This comes very useful for the SOHO (small office/ home office) market.

2. Package content

When you unpack the MobiLink ISDN 2 GSM unit from its protective cardboard box you should identify the components described in the table below. Please ensure that you received the suitable contents; also check that all components are accounted for and that no damage has been sustained during the transport.

Item	Image	Pcs/ Note
MobiLink ISDN 2 GSM equipment		1
USB programming cable for MobiLink ISDN 2 GSM		1/*
Power supply adapter 12VDC / 2,1A		1
External antennas		1-2/ **
Wall mounting kit	-	1 /***
CD with OAM software		1/ ****
User's manual	-	
Warranty certificate	-	

Notes:

**) The package also contains two connecting cable for TE and NT interfaces*
***) Depending on what MobiLink ISDN 2 GSM model of equipment it is (with one or two GSM modules) you will have one or respectively two antennas.*
****) The kit for mounting MobiLink on a wall includes dowels, woodscrews, etc.*
*****) OAM software supplied with MobiLink (isdncfg) includes functions for configuring (programming) the ISDN to GSM interface, routing of calls, sending and receiving SMS. It also includes online help with examples*

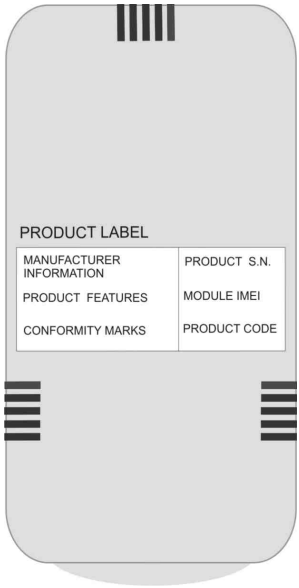
3. Installation

3.1. Labels and identifiers

On the bottom of the case of the MobiLink ISDN2GSM equipment there are glued several labels or tags that show the characteristics and compliance.

3.2. Significance of Labels

These adhesive labels contain information about the manufacturer, type, model, certification, approval, compliance to international and UE directives. The label may include barcodes and refer to:

Rear View of MobiLink	Product label fields
	**MANUFACTURER INFORMATION** Full manufacturer identification: Company, address, origin country, contact information
	PRODUCT FEATURES - Model identification, which allows the network operator to check the terminal as one of its approved models, so no additional certification or approval is required; Description and details of variant, the type of mobile networks it works with, number of mobile modules, supply voltage
	- Conformity marks required by product certification and other UE or international directives
	- indicates exactly what type of product it is. You must mention this code when you call Support for upgrade and for repairs
	PRODUCT IMEI LABEL - IMEI code, International Mobile Equipment Identity for SIM based equipments. A unique 15- or 17-digit number. - The first 6 numbers of IMEI represent the TAC code

3.3. Identifying the connectors

The bottom of the case of MobiLink ISDN 2 GSM unit features all the supply/voice/data connectors:

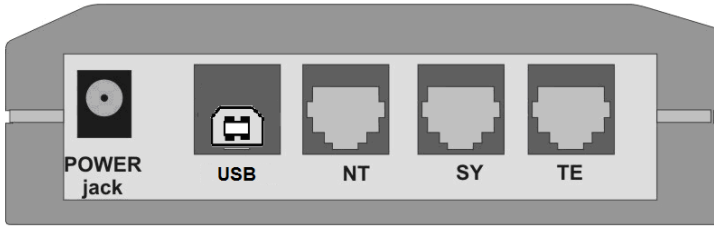


Figure 3-1 Identifying the connectors

- **PWR –** female connector, jack type, for the power supply adapter
- **USB –** USB B connector with standard pin-out, for the USB cable used for configuration (for the connection to PC it requires a free USB A slot)
- **NT –** Network Termination for 4-wire ISDN phone line. Connects MobiLink ISDN 2 GSM to the TE of the ISDN PBX or the ISDN phone set (analog phone may be used via terminal adapter)
- **SY –** synchronization, connections paralleled with TE slot. Used for clock signal synchronization, when cascading several ISDN 2 GSM units together
- **TE –** Terminal Equipment connector for ISDN is used for connecting to an ISDN phone exchange or to the ISDN public telephony network and also, for connecting more than one MobiLink ISDN2GSM unit to the same PBX.
- The two **FME** connectors for the external antennas are located on top of the MobiLink ISDN2GSM equipment, while the slots for the SIM cards and their pushbuttons can be found on the right side of the case, under the LED indicators.

3.4. Configuring the SIM cards

The SIM cards that will be used with MobiLink ISDN 2 GSM must be **activated** by the corresponding GSM operator. Also, they must be properly **configured** before insertion in the GSM slot of the equipment. The configuration of the SIM cards is performed using a GSM phone.

- **Disable request for PIN code** – If the "PIN Code Request" option is disabled, you can insert any value in the "Pin Code" field of the OAM program. When you enter the correct PIN code, it will be stored in the equipment memory and afterwards you need no more bother about PIN code. The MobiLink unit must be connected with the computer that runs the OAM program thru a serial connection in order to modify the "PIN Code" (for more details check the "User manual" for the isdncfg program).

- **Disable GSM services** – most GSM operators assure several services (redirection of calls, vocal mailbox) concerning treatment of incoming calls. These are very useful in case you cell-phone is busy or disconnected; it is advantageous to use the call forwarding features provided by the GSM carrier. But when you use the MobiLink ISDN 2 GSM interface together a phone exchange it is generally better to disable those services, because you perform them locally with smaller costs.

- **Disable Auto-redialing and Auto-answer** – you must disable these options, if they are provided by your GSM operator.

- **Turn off roaming** - international roaming services allows you to make calls with the same GSM subscription when you travel in other countries (where the service provider has signed a signed roaming contract with your GSM operator). The roaming option should be disabled, because MobiLink was designed to work with PBX or ISDN phones in stationary applications. You won't take it in overseas trips! If roaming remains enabled, it is possible that when the local GSM carrier is interrupted, the ISDN 2 GSM interface will connect to a foreign mobile operator and the costs of the calls will be much higher.

Settings for configuration of the SIM cards

Description	Option
Select “OFF” for “Dial again – Interval”.	If this option exists
Select “OFF” for “Auto Answering”	required
Select “OFF” for “Call Waiting”	required

3.5. Inserting the SIM cards

The ISDN 2 GSM interface needs SIM cards for the corresponding GSM operators.

Each SIM card must be inserted in the corresponding slot of the MobiLink ISDN 2 GSM unit. Depending upon the equipment model, it may feature one or two GSM modules, hence one or two slots for SIM cards.

The slots for SIM cards are located on the upper right side of the MobiLink case, under the LED indicators. To insert/ remove the SIM, use the removable tray (SIM holder) which is activated by a small yellow pushbutton.

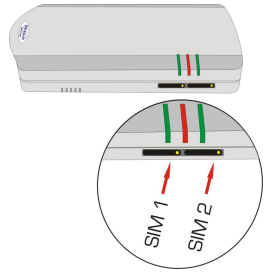


Figure 3-2 Location of SIM slots

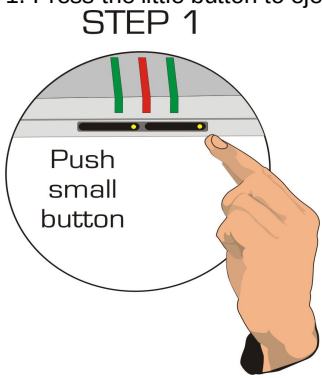
Note:

To push the ejector button, because of its small size, you may need to use a tool with a small, hard tip (keys, pen, screwdriver or tweezers). Handle the SIM cards with care!

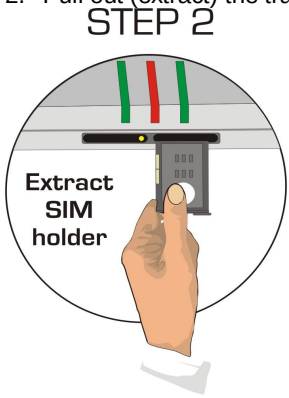
WARNING!
Unplug the MobiLink unit from the main outlet before insert or replace a SIM card!

For each of the SIM card, follow these steps:

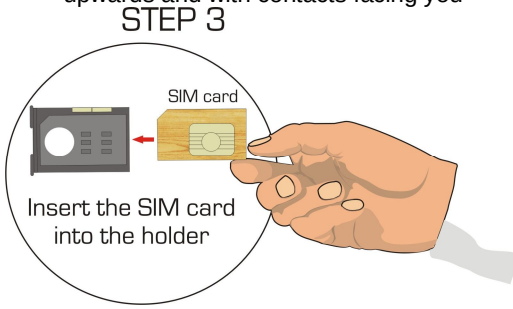
1. Press the little button to eject the SIM holder.



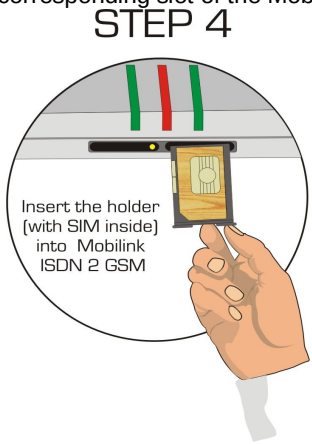
2. Pull out (extract) the tray (SIM holder)



3. Insert SIM card into the holder, as shown – with cut corner upwards and with contacts facing you



4. Push the holder tray with the SIM inside back into the corresponding slot of the MobiLink unit



You should follow the steps described above also when you need to replace the SIM cards already installed into MobiLink.

3.6. Connecting the cables

Connect the data, phone and power cables as shown in the drawing below:

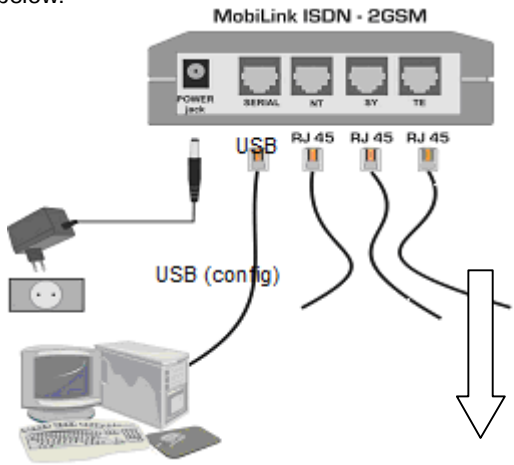


Figure 3-3 Connecting the cables

Use ISDN cables to connect the Rohde&Schwarz Topex unit to your ISDN PBX (or other ISDN terminals). Connect the cables from your corresponding ISDN device to the MobiLink unit. More detailed information on correct connections can be found in chapter 4.2. “Modes of connection”.

For each MobiLink ISDN interface, insert one end of the 4-wire ISDN phone cable in the TE or NT connector of the MobiLink ISDN 2 GSM. The opposite other end of the cable must be connected to the corresponding local or junction interface of the ISDN PBX or to the ISDN phone. The pinout of RJ-45 connectors for TE and NT interfaces is shown in tables at Chapter 3.9 “Pinout for connectors” You should always select the individual NT, TE or SY connections in accordance with chapter 4.2. „Modes of connection”. In order to achieve a good operation, you have to know the pattern of connections required for the application (links required by the ISDN phone exchange or telephone terminals).

USB programming connection – To be able to adjust configuration of your ISDN 2 GSM interface using of the OAM program, you must connect your equipment to a PC. The connection is performed by means of a standard USB A-B cable that connects to the „USB” slot of the MobiLink device. This USB connection is also necessary for sending and receiving SMS messages from your PC and accessing the mail-to-SMS features.

Insert the jack of the power supply adapter (shipped in the MobiLink package) into the PWR connector. Do not yet plug the adapter into the receptacle of the 230V $_{A.C.}$ mains outlet!

Note:

If you start up MobiLink ISDN 2 GSM and the antennas are not connected, the transmitter of the GSM module could be damaged.

Warning: *The supply adapter is the disconnection device (there is no POWER switch on MobiLink ISDN), so the 230 V_{AC} socket-outlet shall be installed near the Rohde&Schwarz Topex equipment and shall be easily accessible.*

3.7. Installing the external antennas

MobiLink ISDN 2 GSM features two RF connectors on top, for connecting the antennas for the wireless network. You may use:

- ☐ the wideband antenna supplied with the package, with cable and magnetic base (see below characteristics)
- ☐ or other kinds of external antennas with higher gain or directivity (Yagi), if the need arises.

The following table shows the main characteristics of the dual-band stick antennas with magnetic base (currently supplied with the MobiLink ISDN 2 GSM package).

Frequency bands	GSM 890-960 MHz PCN 1710-1880 MHz PCS 1850-1990 MHz
Gain	2 dBi
Polarization	Vertical
Base	Magnetic, 2,8cm
Cable	Type RG174, length 2,5 m
Connector	Female FME

The two antennas must be threaded to the FME male connectors located on top of the MobiLink ISDN 2 GSM unit, as shown in the following drawing.

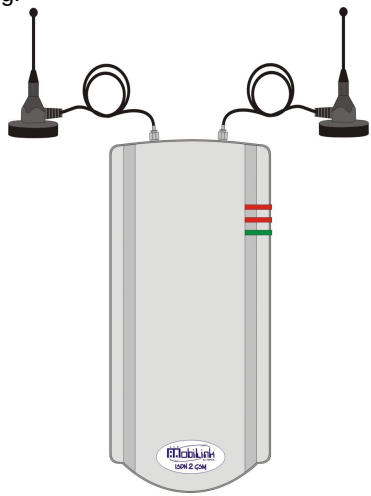


Figure 3-4 Connecting external antennas.

Plug the cable connector and tighten the flange lightly, by hand. Do NOT use a spanner or screw key, which could damage the antenna connectors!

The external antennas must be installed in a place with a good strength of the GSM signal. The antenna has vertical polarization; it must be placed in vertical or horizontal position, depending of the local field condition.
If the SIM cards used are for different GSM operators, you may need to place each antenna in a location with maximum strength of the received signal from the respective GSM carrier.

MobiLink ISDN 2 GSM and its antennas must be located as far as possible from equipment that is sensitive to electromagnetic interferences (radios, audio or video appliances, computer monitor, TV receivers etc). If you place the MobiLink interface or its antennas too near radio, TV, or other sensitive appliances, their operation could be affected.

Note1:

*The antennas of the MobiLink ISDN 2 GSM interface sends out RF energy so they should NOT be placed very close to people. Since the GSM interface transmits for longer periods of time, being used by several people (most of the calls of local subscribers are routed through it) the radiation will be accordingly **higher** than for a cell-phone used only infrequently, by a single person.*

Note2:

Remember to connect the antennas before powering up MobiLink, to avoid damage to the transmitters of the GSM modules

3.8. Jumper settings

MobiLink ISDN-2-GSM features several jumpers located on the printed circuit board, inside the plastic case of the equipment.

These jumpers control functions seldom require access, in normal operation you do not need to change the settings, this is why they are located inside the plastic cover of the equipment.

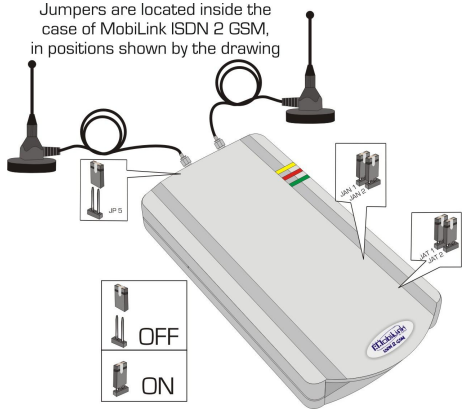


Figure 3-5 Location of jumpers.

3.9. Bootloader enable

Useage

If an abnormal interruption occurred in the loading of an image file, you must use the JP1 jumper.
When MobiLink ISDN has loaded a corrupt or incomplete image file, it cannot operate. But if it does not work, you cannot load a proper, correct firmware image to it!
To fix this problem, you must set the jumper on the JP1 pins to force the bootloader to start and load the correct firmware. For details about uploading fimrware (how to load a new image file) please refer to the OAM manual ifor sdncfg.exe

Note:

Remember to take the jumper off pins JP1 before resuming normal operation of the ISDN 2 GSM equipment.

Location

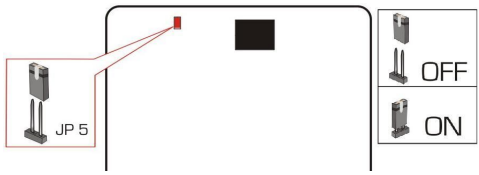


Figure 3-6 JP5 jumper location

JP1 is alone (no other jumpers in the near).

3.10. Terminal resistors

Usage

These pairs of jumpers (JAN1 and JAN2 for the NT interface, JAT1 and JAT2 for the TE interface) configure the impedance matching (termination) resistors for the respective interfaces.

By default, these jumpers are ON so the terminal resistors are connected. You should take the jumpers OFF if terminal resistors are not required.

When you have several ISDN devices connected to an ISDN line, the line must end with impedance matching resistors, also called terminal resistors. This is required, for instance, when cascading several MobiLink interfaces and using synchronization.

One solution for termination is to use a terminal block with matching resistors inside. But when the last device is a MobiLink ISDN equipment, you can use the termination resistors that are included with the equipment. Remember, out of several MobiLink units cascaded on the ISDN line, only the last unit must have the termination resistors enabled.

Location

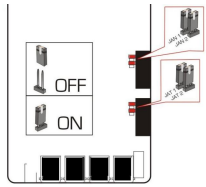


Figure 3-7 Location of JAT1, JAT2, JAN1 and JAN2 jumpers

The pairs of jumpers (JAN1 and JAN2 for the NT interface, JAT1 and JAT2 for the TE interface) are located towards the edge of the MobiLink printed circuit board.
Each pair of jumpers is near a black rectangle (ISDN transformers). JAN1 and JAN2 are the first pair; below them you may find the second pair, JAT1 and JAT2 respectively. The jumpers are in horizontal position.

3.11. Power up MobiLink ISDN-2-GSM

Insert the jack of the power supply adapter (shipped in the MobiLink package) into the PWR connector.

Then plug the adapter into the receptacle of the $230V_{A.C.}$ mains outlet.
MobiLink ISDN 2 GSM will start working immediately.
You should see the green LED indicator (PWR) lighting up.

WARNING!
To avoid accidents or damage to the equipment, follow the installation steps described earlier. The supply plug of the adapter must be the last connection made. You should NOT connect the cables for serial configuration, phone or PBX while the MobiLink ISDN-2-GSM unit is powered. Also, don't take out the antennas while MobiLink is working.

Note: *The adapter is the disconnection device (there is no POWER switch), so the 230 V_{AC} socket-outlet shall be installed near the equipment and shall be easily accessible.*

3.12. Significance of LED indicators

The MobiLink ISDN 2 GSM equipment has three LED as optical status indicators, shown in the figure to the right.

Location of the LED status indicators: form top downwards you have the GSM LED, the ISND LED and the power supply LED.

The first two are bi-color (red / green) while the Power led lights only green.

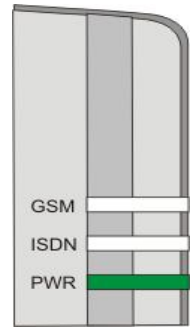


Figure 3-8 Location of the LED status indicators

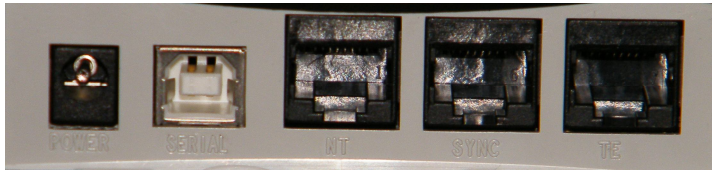
Functions of LED`s status

Each LED may light green or red, continuously or blinking with different frequencies, as shown in the table below:

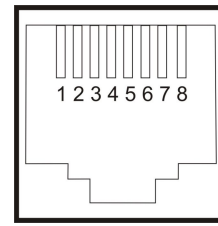
LED	Status	Significance
Topmost (GSM)	This dual color LED shows the status of GSM modules. It lights green to indicate GSM 0 and red to indicate GSM 1.	
	Blinking fast, 5 Hz	The GSM module is initializing
	Blinking, 1 Hz	Wrong PIN number (PIN error)
	Blinking slow, 0.5 Hz	GSM module is searching for the network (antenna not installed, or MobiLink not in the coverage area of the GSM network)
	Off	GSM module has registered to the network and is in standby
	On, continuously	GSM module is busy (in a call or just allocated)
Middle (ISDN)	Information about synchronization of ISDN interfaces. Here green color indicates the NT interface and red color refers to the TE interface of MobiLink.	

	Blinking 0.25 sec then one sec off	Interface not synchronized. For example, if green LED lights 0,25 sec then red LED lights 0,25 sec it means both interfaces are not synchronized.
	Off	The ISDN interface is synchronized
Lower (Power)	Lights continuously green	The supply voltage is present
	Off	There is no supply voltage

3.13. Pinout for the connectors



MobiLink ISDN 2 GSM features four data connectors at the bottom of its case. Three connectors are of the same type, female RJ-45, but they have different functions. Please read the paragraph carefully and perform the connections accordingly. The fourth is an USB-B connector.



USB connector

The USB-B connector is used for management of the equipment: administration / programming, updating of firmware, saving/restoring configurations, saving CDR files, sending and receiving SMS form the computer connected to MobiLink ISDN-2-GSM

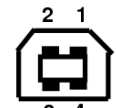
For programming you must use a standard USB A-B connection cable. This cable is included in the package of the MobiLink ISDN 2 GSM equipment.

The end towards MobiLink features a male USB B connectors, while towards USB slot of the computer features a standard male USB A connector.

In the drawing below you see the pin numbering and functions for the USB female connector of MobiLink ISDN and a photo of the male connector of the USB programming cable.

PC USB Connectors Pinout

1 = +5 Volts
2 = -Data
3 = +Data
4 = Ground



FEMALE END

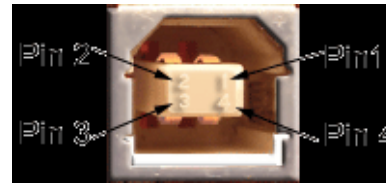


Figure 3-9 USB-B connector

See table below for pinout of cable and its connectors.

Pin	Signal	Color	Description
1	VCC		+5V
2	D-		Data -
3	D+		Data +
4	GND		Ground

Cable

Pin one side	Signal	Description	Pin other side
1	USB Vcc (Vbus)	usually RED, wire should be 20-28 AWG	1
2	USB Data -	usually WHITE, wire should be 28 AWG	2
3	USB Data +	usually GREEN, wire should be 28 AWG	3
4	GND	usually BLACK, wire should be 20-28 AWG	4

USB is a serial bus. It uses four shielded wires: two for power (+5v & GND) and two for differential data signals (labelled as D+ and D- in the above pinou diagramt). NRZI (Non Return to Zero Invert) encoding scheme used to send data with a sync field to synchronise the host and receiver clocks. In an USB data cable tha Data+ and Data- signals are transmitted on a twisted pair. No termination is required! The half-duplex differential signaling helps combat the effects of electromagnetic noise on longer transmission lines.

USB Advantages / Limits:

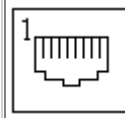
- upon connection the USB devices are automatically detected and configured by the Operating System;
- transmission speed is up to 480 Mbps, much higher than fior the RS-232 link;
- there are currntly available a large amount and diversity of USB devices and products. The serial (COM) link is a legacy device, many contemporary PC's or notebooks do no longer have serial ports!
- The USB standard is an open standards, with worldwide industry support;
- It supports multiple transfer rates and data transfer types, to address the requirements for different kinds of devices;
- There is a very large support base for USB software developers and high availability of code for example device drivers (class drivers);
- USB is supported by most of the latest verisons of Operating systems;
- USB 3.0 and 2.0 devices are compatible with USB 1.1.
- USB cable length is limited to max. 5m, although total lengtth of up to 30 m can be attained using several hubs. But this is not required, typically the ISDN box to be configured is less than 5 m away from the OAM computer!

The data cables for USB 1.x and USB 2.x use a twisted pair to reduce noise and crosstalk. USB D+ and D- are twisted in cable. Outer shell is made of copper braid and aluminum shield.

The maximum length of a standard USB cable (for USB 2.0 or earlier) is 5.0 meters (16.4 ft). This maximum length is reached for thick cable **AWG20** (0,8 mm diameter) and will be reduced to 0.8 m in case of thin cable **AWG28** (0,3 mm diameter).The primary reason for this limit is the maximum allowed round-trip delay of about 1,500 ns. If USB host commands are unanswered by the USB device within the allowed time, the host considers the command lost.

ISDN connectors

ISDN connectors are eight way RJ45 sockets ,

Male	Female
	

typically connected as shown:

Pin	Signal	Polarity
1	Power Source/ Sink 3	+
2	Power Source/ Sink 3	-
3	Transmit/ Receive	+
4	Receive/ Transmit	+
5	Receive Transmit	-
6	Transmit/ Receive	-
7	Power Source/ Sink 2	-
8	Power Source/ Sink 2	+

The pair 3/6 is colored white/green wile the pair 4/5 is blue/white.

The extension wiring for an ISDN line must daisy chain each socket connecting to the last back to the NT unit. You can either have one terminal up to 800m away from the NT unit, or any number within 150m (total cable length). The last socket on the cable must have terminating resistors enabled, and the NT must have its termination turned off. Termination / impedance matching resistors are 100-ohm terminating resistors across wires 3-6 and 4-5. The polarity should be preserved.

You can wire ISDN lines using only two pairs (4/5 and respectively 3/6) as the additional pairs (orange and brown) are used for optional power lines. The optional power lines are not used by most ISDN phones as there is also power provided on the 3/4/5/6 lines.	

TE connector – used for connecting the TE port of MobiLink ISDN to a NT interface.
For the ISDN system, a Terminal Equipment is any piece of communicating equipment that complies with the ISDN standards. Examples include: digital telephones, ISDN data terminals, Group IV Fax machines, and ISDN-equipped computers.

In most cases, a TE should be able to provide a full Basic Rate Access (2B+D), although some TEs may use only 1B+D or even only a D channel. The TE interface of the MobiLink ISDN 2 GSM unit is used for connection to NT interfaces of the ISDN private branch exchange or of the ISDN public telephony network. TE interfaces are provided with embedded termination resistors. These resistors may be enabled by means of corresponding jumpers, the pair JAT1 and JAT2.

See table below for pinout of TE interface

Pin	Signal
1	not connected
2	not connected
3	Tx
4	Rx
5	Rx
6	Tx
7	not connected
8	not connected

NT connector – used for connecting the MobiLink NT port to a TE interface.
Network Termination devices form the physical and logical boundary between the customer's premises and the carrier's

network. In most cases, a single device, such as a PBX or digital multiplexer, performs both physical and logical interface functions.

The NT ISDN interface of MobiLink is to be used for connection to TE interfaces of the ISDN PBX or to ISDN terminals.
For pinout of NT interface of MobiLink see table below:

Pin	Signal
1	not connected
2	not connected
3	Rx
4	Tx
5	Tx
6	Rx
7	not connected
8	not connected

SY connector

The Synchronization connector is internally paralleled to the TE interface of MobiLink ISDN. This Sync connector must be used when connecting several MobiLink ISDN 2 GSM units together, to ensure synchronous operation of all devices.

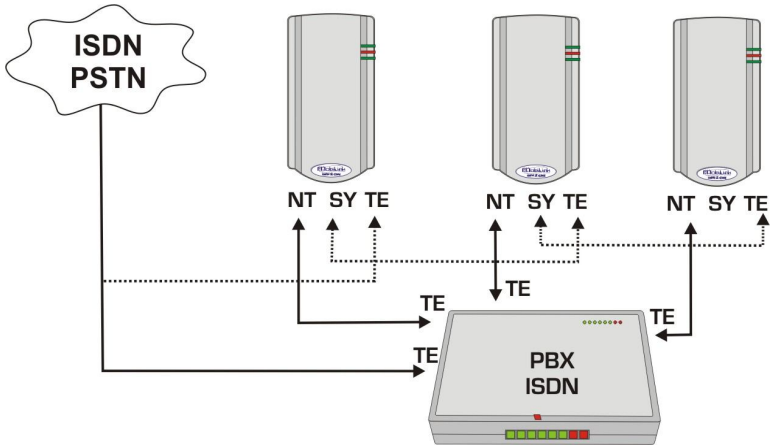


Figure 3-10 Usage of SY connector

For details see Chapter 4.2, about modes of connecting the MobiLink ISDN 2 GSM unit.

3.14. Mounting the MobiLink ISDN 2 GSM equipment

When selecting the location for mounting MobiLink please bear in mind the recommendations from the paragraph “Operating environment”

The Rohde&Schwarz Topex ISDN 2 GSM equipment can be placed either in vertical position on a wall or horizontally on a desk or in a shelf.

MobiLink ISDN 2 GSM and its antennas must be located as far as possible from equipment that is sensitive to electromagnetic interferences (radios, audio or video appliances, computer monitor, TV receivers etc). Also, the GSM antennas must be mounted in a place with maximum strength of the received signal.

For mounting MobiLink ISDN 2 GSM on a wall you must use the mounting kit (plastic dowels, woodscrews, etc) provided by Rohde&Schwarz Topex.

Perform the following steps:

- mark the position of a pair of holes on the wall, spaced at 55 mm apart
- drill the holes in the wall
- forcibly insert into the holes the plastic dowels
- thread the metallic woodscrews into the plastic dowels leaving the end to protrude outside for some 5 mm
- hang the case of MobiLink ISDN 2 GSM in the two metallic woodscrews and push it down a little to get it fixed

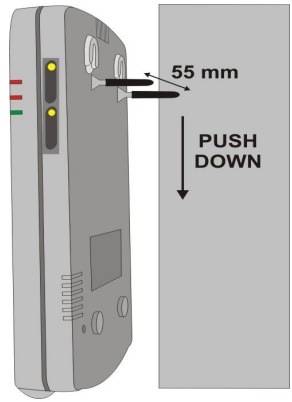


Figure 3-11 Mounting MobiLink on a wall

4. Installing the OAM program

The OAM program called ISDNCFG is required in order to configure and control the MobiLink ISDN 2 GSM equipment. Also, it allows you to send and receive SMS messages from the computer that is connected to MobiLink via USB cable.
This Operation, Administration, and Maintenance program runs under Windows operating system.
To install the program, connect to the MobiLink the PC you will use for programming, by means of the USB A-B cable for configuration.

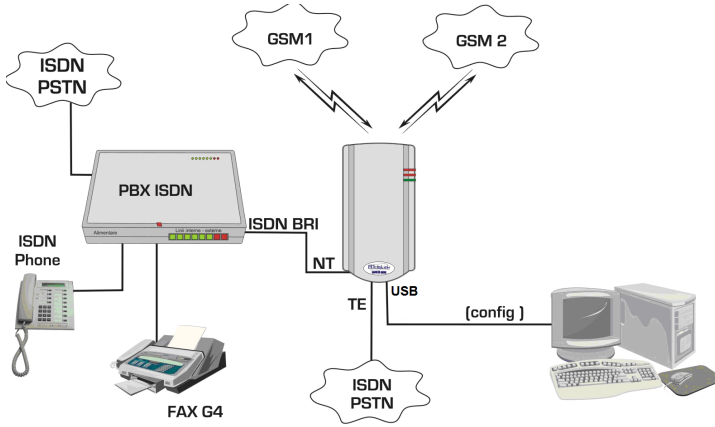


Figure 4-1 Configuring MobiLink via serial connection

Set the communication on the COM serial channel where the MobiLink ISDN 2 GSM is connected.
Just insert the mini CD-Rom into the corresponding drive unit and copy the structure of folders and files to your hard disk drive.

Then run the ISDNCFG.EXE file from the folder on the hard disk

By means of the graphic interface of the configuration program you can begin to adjust MobiLink settings (parameters for GSM modules, ISDN TE and NT interfaces, routing table, CLIP table, name of connection, etc.)
You must establish the settings according to the routing functions that your application requires.

For details, please see the "**Operating Manual**" for the OAM program ISDNCFG. The manual includes several examples of configuration of parameters for usual applications.
Also, the OAM program features online help, providing you information about each command.

5. Operation and modes of connection

5.1. Routing for least costs

No matter which mode of connection is used, the purpose of MobiLink is to achieve Least Cost Routing of calls. The LCR function of the MobiLink ISDN 2 GSM interface ensures that in each case calls (incoming or outgoing) are routed through the direction with minimum costs. For example, if a local subscriber of the PBX makes a call, the prefix will be analyzed and the call will be routed accordingly, either to the public ISDN network or to one of the GSM operators. This way, instead of paying for a fixed-to-mobile call, you will have only the low cost of a fixed-to-fixed of mobile-to-mobile call inside the same network. This holds true also for calls coming in from your agents in the field who make calls from mobile phone: they will pay just for a mobile-to-mobile conversation, avoiding interconnection fees. Using the DISA feature, the mobile callers may get the extension they want, without need for a human operator of the PBX.
Alternately, the two GSM channels of MobiLink may feature SIM cards for the same mobile provider, but with different subscriptions. The OAM program will select the best subscription for any given moment of time (for example, the operator that provides lower tariff by night or during the weekend).

Another instance of getting lower tariff by using MobiLink is when several subscribers of your PBX make calls to a certain mobile provider. Since most of the calls to that provider will be routed through a specific GSM module of MobiLink, you may use for that module a SIM with convenient tariff rate (low cost per minute for a very large number of minutes used).

In case you connect several MobiLink ISDN 2 GSM units to an ISDN phone exchange, the possibilities of routing calls for least costs are even better. First, you are no longer limited to two GSM modules, you may use modules with SIM cards for two or three mobile providers, each with different subscription that allows you to get a better tariff rate.
Second, if both GSM modules in a MobiLink interface are engaged (busy), the call to a mobile network may not only be rejected but instead routed through another MobiLink ISDN 2 GSM connected to the same PABX.
The OAM program uses CLIP to check the identity of the callers against a data base. Thus calling can be restricted to certain selected (authorized) subscribers, avoiding unnecessary costs.
Caller identification may be used for automated routing of calls.
All incoming call that contains information about the phone number of the subscriber (ID) will be checked by the OAM program against the CLIP routing list. Depending upon the “Action” you have set up,

the program will route the call accordingly, to the operator of the PBX, to a certain local extension or will provide DISA tone.
DISA – direct inward access – alows callers to select the extension they want without help from an operator, via DTMF codes. Also, they can dial out of the exchange.
If the incoming ID is missing, the default routing options apply.
With the “Nr. of Dialed Digits” option MobiLink makes the call immediately after receiving the last digit, any digit sent afterwards will be ignored.

5.2. Modes of connection

Here you have a few examples of connecting the MobiLink equipment to an ISDN phone exchange.
The ISDN 2 GSM interface can be connected either as TE, when it acts as a terminal equipment, or as NT, when it simulates ISDN network.
Also, it may be used as a pass-through device that is “transparent” for the calls. In this case the MobiLink ISDN 2 GSM equipment is inserted between the public ISDN network and the PBX.
These three basic modes of connecting MobiLink can be combined in different ways, as shown further.

5.2.1 MobiLink connected via NT to a TE junction of the PABX

NT connector of the GSM-2-ISDN linked to TE of the PABX, TE of the PABX goes to the public ISND. You may use the TE interface to get the clock signal for synchronization, as shown below.

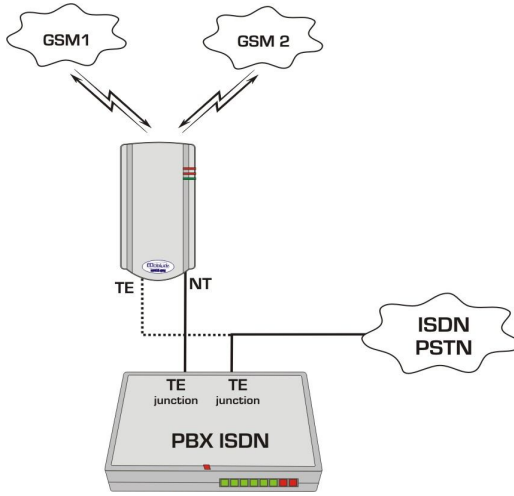


Figure 5-1 MobiLink connected to TE junction of PBX

Outgoing from PABX

The PBX routes the calls to mobile networks through the MobiLink unit. The MobiLink may use one or two directions for this (DIR0 for module GSM0, one mobile network, DIR1 for module GSM1, the other mobile operator)

Incoming GSM to PABX

The decision is taken depending upon the CLIP GSM table or the GSM port settings if the incoming phone number is not found in the table.
The call is sent only thru the MobiLink's TE interface. In the CLIP-GSM table, the "ACTION" field value must be set on "NT" and the "Port" field from "GSM settings" menu will be set on "NT".

5.2.2 MobiLink connected via TE to NT local of PABX and via NT to TE junction of the PABX

NT connector of the GSM-2-ISDN linked to one TE junction of the PABX. Other TE junction of the PABX goes to the public ISDN network. The TE connector of the GSM-2-ISDN unit goes to the NT of a local board of the PABX

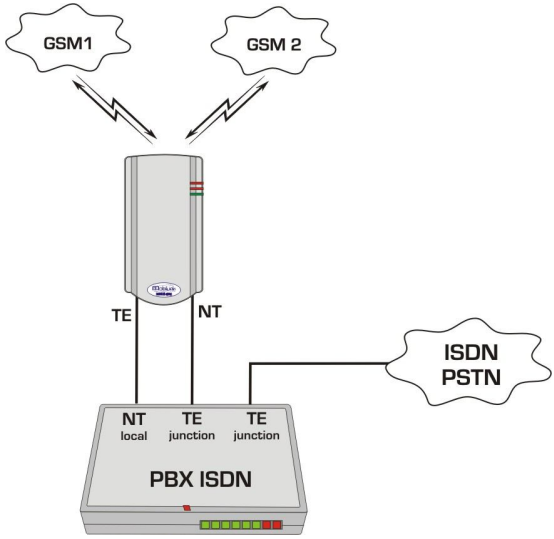


Figure 5-2 MobiLink connected to PBX with both NT and TE interfaces

Outgoing from PABX

The PABX unit verifies the number dialed and routes the call for the public network thru the dedicated interface and the call for the mobile network thru the MobiLink's NT interface. The MobiLink unit selects one mobile network operator to send the call.

Incoming to PABX

Calls get into PABX via TE connector. When an incoming GSM call comes in, if the setting in the GSM window is Operator, the call will go to the local extension from Target. From the PABX the call is considered to be a local call!
If the setting is DISA, the caller gets a DISA tone and he can dial any local subscriber he wishes. Also, he can make calls from the public network, acting as a local subscriber.

5.2.3 MobiLink connected to PBX on NT interface and to public ISDN via TE interface

The public ISDN network is connected directly to the Rohde&Schwarz Topex MobiLink equipment via TE interface. The NT connector is used to link to a TE junction of the PABX.

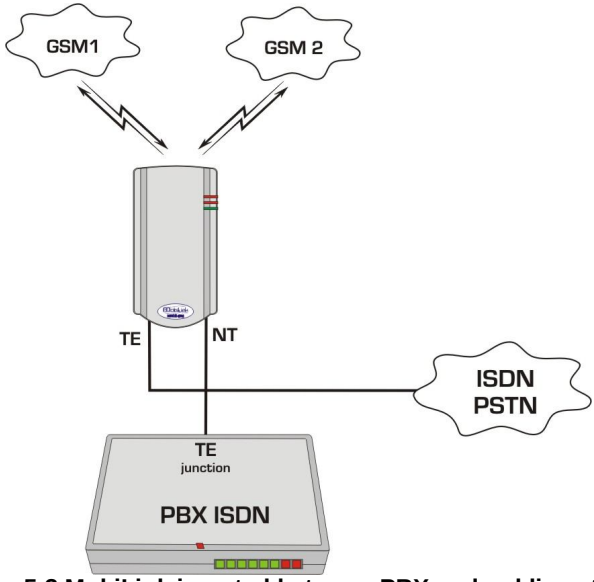


Figure 5-3 MobiLink inserted between PBX and public network

Outgoing calls

In this case calls coming from PABX junction through NT connector of ISDN-2- GSM can be routed through one of the three directions: GSM0, GSM1 and TE (which goes to the public ISDN network). The routing is performed by the MobiLink ISDN-2- GSM unit.

Incoming to PABX from ISDN network

The calls from the public ISDN are transferred transparently towards the PABX. For this, in the TE configuration window check “Pass-Through” options.

Incoming to PABX from GSM network

The calls from GSM network are treated according to the specifications presented on paragraph “a”.

5.2.4 MobiLink connected to PABX via TE only

The TE interface of the MobiLink is connected to the NT of a local board of the PABX.
The NT interface of ISDN-2- GSM is **not used** in this case.
The PABX connects to the public ISDN via another TE junction.

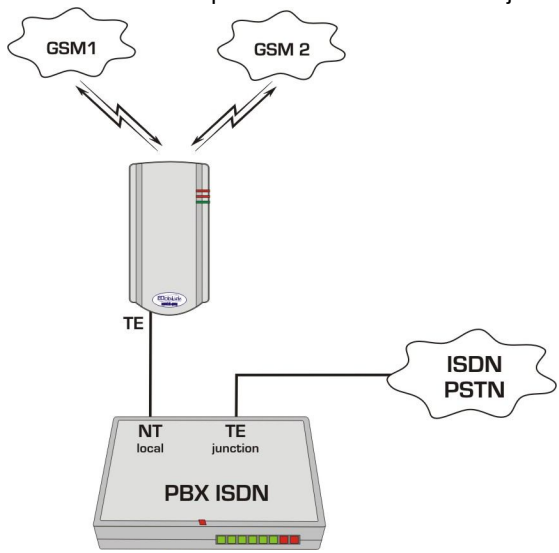


Figure 5-4 MobiLink connected to NT local of PBX

Outgoing from PABX

The local subscriber calls the number of the local extension on position where the MobiLink is connected. MobiLink answers, takes over the numbering, then sends out the call into the adequate GSM network. The number of the mobile subscriber must be dialed in DTMF mode.

Incoming to PABX from the GSM network

As shown earlier, the call identity is checked with the CLIP-GSM table and the call is sent thru the MobiLink's TE interface to the PABX. If the call identity is missing or it can't be found in the CLIP-GSM table, the call will be routed according to the settings of the GSM module ("DISA" or "OPERATOR").

5.2.5 Using several MobiLink ISDN 2 GSM units

There are situations when you need to connect more than one MobiLink unit to a PABX: when you must use more than two mobile network directions or there is a lot of traffic towards the mobile network.

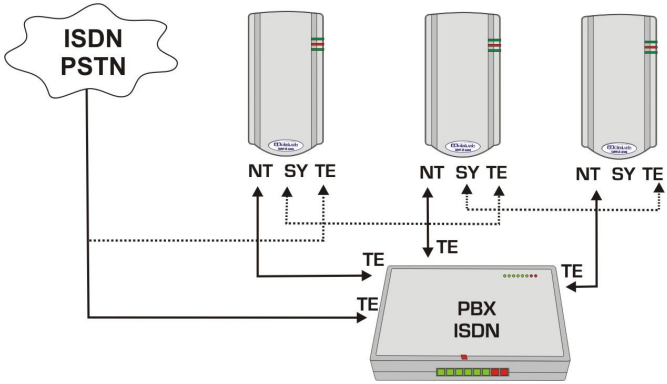


Figure 5-5 Cascading several MobiLink units

To ensure synchronous operation of the MobiLink units, clock synchronization is taken from the Public ISDN and goes to the TE connector of the first MobiLink.
Please check the figure above to see the connection mode.

REMEMBER! When you use more than one ISDN terminals on the same ISDN line (4 wire bus), you must end the ISDN line with terminal resistors.

For this, you can use a termination line jack (termination block) with adequate impedance matching resistors (value is 100ohm).
Alternately, if the last device in the chain is a MobiLink ISDN equipment, you may use the embedded termination resistors. Both NT and TE interfaces of the MobiLink ISDN equipment feature termination resistors which can be configured by means of jumpers.

The pair of jumpers JAN1 and JAN2 connects the matching resistors to the NT interface, while the pair of jumpers JAT1 and JAT2 connects the matching resistors to the TE interface of MobiLink.

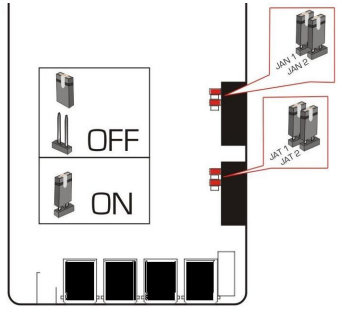


Figure 5-6 Location of JAT1, JAT2, JAN1 and JAN2 jumpers

By default, all jumpers are set, so termination resistors are connected.

Note:

Remember to take the jumpers OFF as required. In a configuration with several ISDN terminals connected together, only the last device in the line must have termination resistors.

6. Technical specifications

GSM modules	
Mobile networks	Quad band -GSM/GPRS: 800/850/1800/1900 MHz
Compliant to	GSM phase 2/2+
Maximum RF output power	Class 4 (2 W) for EGSM900 Class 1 (1 W) for GSM1800
Control	via AT commands
Power consumption:	– Idle mode (registered) 25 mA – Speech mode 300 mA – Peak <2.5 A – Power down 50 mA – Sleep mode 3.5 mA
Reception sensitivity	-104 dBm
SIM card	3 V, plug-in card
Antenna connector	FSM, 50 Ω impedance
External antenna	Dual band, 3m long cable, magnetic base
Extra features	- DTMF (Dual Tone Multi Frequency) - Half rate, Full rate or Enhanced full rate - Echo cancellation and Noise reduction
Optical indicator	Dual color LED, green for GSM 0 and red for GSM 1

BRI ISDN Line	
Connectors	Standard RJ45 connector for ISDN
ISDN protocol	EuroISDN, DSS - 1
NT interface	So, point to multipoint So, point to point
TE interface	So, point to multipoint So, point to point
SY	Synchronization, paralleled to TE
Optical indicator	Dual color LED, red for TE interface and green for NT interface
Power supply	
Special adapter	Input: Mains 230 V AC 0,3A / 50Hz Output: jack, 12V DC / 2,08A

USB	
Standard	USB 2.o
Connector	Standard USB-B connector
Signals	Vcc (+5V), Data +, Data – and Ground.

Overall	
Operating temperature range	From 5 to 50°C
Humidity	10 to 80%, non-condensing
Dimensions (L x W x H)	222 x 115 x 32 mm
Weight	500 g – MobiLink ISDN 2 GSM unit 1 kg – the whole package

7. Operating environment

MobiLink ISDN 2 GSM equipment was designed to work **inside** buildings, so it must be installed only in closed rooms or enclosures, where the environment conditions should be inside the limits specified in the “Tech specs” table.
You must NOT allow exposure to rain, dripping water, condensed humidity, mist, etc
You should avoid dust and prolonged exposure to Sun radiation.

In order to ensure adequate working temperature, the ISDN 2 GSM interface must not be used too near heat sources or in direct sunshine.
Also, it must not be overcrowded: you must leave free space around, below and above the MobiLink interface. This is needed both for connecting phone / data / antenna cables, and also for ventilation (natural air cooling to dissipate the heat generated during operation).

Remember, when allowed operating temperature is exceeded this may not have an immediate, visible effect on the MobiLink unit, but it can result in unreliable operation, accelerated ageing and hence diminishing of lifetime.

MobiLink ISDN 2 GSM must NOT be used in flammable or explosive environment, or in locations where toxic, aggressive, corrosive or flammable gases may accumulate.

When cleaning the plastic case of the unit, take care not to use aggressive liquids or solvents.

The MobiLink equipment should be handled with care, to avoid mechanical shocks and blows.
It must not be used in places with high level of vibrations such as manufacturing floors, heavy-duty trailers or railway cars.

Also, MobiLink ISDN-2-GSM should not be used in an environment with high level of EMI (electromagnetic interference), near copiers, PC monitors, TV sets or other audio-video appliances or high power equipment such as electric motors or heaters.

When selecting the location for installing MobiLink ISDN 2 GSM and its external antennas you must remember the recommendations described in the chapter about mounting the equipment.

MobiLink ISDN 2 GSM does not include materials or components that are harmful to the environment.
When the life cycle of this equipment is finished and it cannot be repaired or re-used anymore, you should dispose of it in accordance with laws and legal regulations that are valid in your area.

8. Benefits

MobiLink ISDN 2 GSM creates a direct voice connection between an digital fixed telephone and the GSM wireless communications network. You connect the cable of the ISDN phone exchange or ISDN terminal to the MobiLink ISDN 2 GSM unit and have access to the mobile network without the need for a connection (landline) to the fixed telephony operator.

Also, if you want to call from a mobile terminal, you will dial the number of the SIM inserted into the slot of the MobiLink ISDN 2 GSM unit and your call will be automatically directed to the fixed phone in your office home.
The main advantage of using the ISDN-2-GSM gatwway is eliminating interconnection costs between fixed and mobile telephony networks. Thus, MobiLink is generally connected to an ISDN PBX that provides routing and distributes the calls to all local subscribers. But it can also be useful for private persons or small companies who don't have access to the fixed telephony network, that is they have no phone landline to their homes or offices. With MobiLink ISDN-2-GSM they will be able to use their ISDN fixed phone to call anywhere through the GSM telephony network.

THE BENEFITS INCLUDE:

- ☐ The immediate installation of an ISDN connection in remote areas, that may not be reached by phone lines, but which are inside the coverage area of the GSM mobile network
- ☐ The means of easy use of an ISDN terminal (telephone sets), for calls to a GSM network.
- ☐ Getting rid of the radiation of the cellphone. The GSM modems and the external antennas of MobiLink ISDN-2-GSM will NOT be located near the user or close to audio or video appliances that could be sensitive to EMI.
- ☐ Sending and receiving SMS from the computer that is connected to MobiLink, by means of its convenient e-mail to SMS and SMS to e-mail features.

9. Regulatory Information

I. Electrical Safety Information

A) Compliance is required with respect to the voltage, frequency, and current requirements indicated on the manufacturer's label. Connection to a different power source than those specified herein will likely result in improper operation, damage to the equipment or pose a fire hazard if the limitations are not followed.

B) There are no operator serviceable parts inside this equipment. Service should be provided only by a qualified service technician.

C) This equipment is provided with a detachable power supply adapter, use only this adapter in order to power the equipment.

II. Emissions and Immunity Information

A) Notice to Users in the European Union:

Use only the provided power supply adapter and interconnecting cabling provided with the equipment. Substitution of provided power supply and cabling may compromise electrical safety or CE Mark Certification for emissions or immunity as required by the following standards:
This equipment has been tested to the requirements for the CE Mark as required by EMC Directive 89/336/EEC indicated in European Standard EN 55022 Class B and the Low Voltage Directive 73/23/EEC as indicated in European Standard EN 60950.

B) General Information to all Users:

This equipment generates, uses and can radiate radio frequency energy. If not installed and used according to this manual the equipment may cause interference with radio and television communications.

In order to meet emission and immunity requirements, the user must observe the following:
a) Use only the provided I/O cables to connect this device with any computer.
b) To ensure compliance, use only the provided manufacturer's approved accessories.

Disclaimer!

The manufacturer reserves the right to modify the product and manual for the purpose of technical improvement without prior notice.

The manufacturer guarantees the good functioning of the product provided that it has been correctly installed and the directives for storage and usage have been respected. The warranty implies exclusively repairing or replacing the defective unit.

The warranty does not include any indirect losses or loss of profit. The manufacturer is not liable for any damage, whether direct, indirect, special, incidental, or consequential, as a result of using **MobiLink ISDN2GSM**.

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We certify hereby that the **MobiLink ISDN2GSM** unit is manufactured in concordance with the legal provisions concerning responsibility towards the quality of delivered products, fulfills the quality parameters specified in its “User’s manual” and is fit for the purpose for which it has been designed. We also warrant that the equipment will perform substantially in accordance with the accompanying documentation.

Any comments, suggestions and proposals of yours concerning our products are welcome and we are gladly waiting for your feedback at the following address.

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